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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷: C07K 147/05	A2	(11) International Publication Number: WO 00/22001 (43) International Publication Date: 20 April 2000 (20.04.00)
(21) International Application Number: PCT/EP99/07671 (22) International Filing Date: 13 October 1999 (13.10.99) (30) Priority Data: 98402540.3 13 October 1998 (13.10.98) EP (71) Applicant (for all designated States except US): SANOFI-SYNTHELABO [FR/FR]; 174, avenue de France, F-75013 Paris (FR). (72) Inventors; and (75) Inventors/Applicants (for US only): RENARD, Stéphane [FR/FR]; 290, avenue Napoléon Bonaparte, F-92500 Rueil Malmaison (FR). AVENET, Patrick [FR/FR]; 50, rue de Vauhallan, F-91120 Palaiseau (FR). (74) Agents: ERNEST GUTMANN-YVES PLASSERAUD S.A. et al.; 3, rue Chauveau-Lagarde, F-75008 Paris (FR).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: A NEW POTASSIUM CHANNEL OF THE ERG FAMILY

(57) Abstract

Herg4 polypeptides and polynucleotides and methods for producing such polypeptides by recombinant techniques are disclosed. Also disclosed are methods for utilizing herg4 polypeptides and polynucleotides in the design of protocols for the treatment of (i) dysfunctions or diseases, including, but not limited to, epilepsy, migraine, cell proliferation, comportmental troubles, among others and diagnostic assays for such conditions.

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<p>(51) International Patent Classification ⁷ : C12N 15/12, C07K 14/705, 16/28, G01N 33/566</p>	<p>A3</p>	<p>(11) International Publication Number: WO 00/22001 (43) International Publication Date: 20 April 2000 (20.04.00)</p>
<p>(21) International Application Number: PCT/EP99/07671 (22) International Filing Date: 13 October 1999 (13.10.99) (30) Priority Data: 98402540.3 13 October 1998 (13.10.98) EP (71) Applicant (<i>for all designated States except US</i>): SANOFI-SYNTHELABO [FR/FR]; 174, avenue de France, F-75013 Paris (FR). (72) Inventors; and (75) Inventors/Applicants (<i>for US only</i>): RENARD, Stéphane [FR/FR]; 290, avenue Napoléon Bonaparte, F-92500 Rueil Malmaison (FR). AVENET, Patrick [FR/FR]; 50, rue de Vauhallan, F-91120 Palaiseau (FR). (74) Agents: ERNEST GUTMANN-YVES PLASSERAUD S.A. et al.; 3, rue Chauveau-Lagarde, F-75008 Paris (FR).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). <hr/><p>Published <i>With international search report.</i> (88) Date of publication of the international search report: 21 September 2000 (21.09.00)</p> </p>
<p>(54) Title: A POTASSIUM CHANNEL OF THE ERG FAMILY (57) Abstract Herg4 polypeptides and polynucleotides and methods for producing such polypeptides by recombinant techniques are disclosed. Also disclosed are methods for utilizing herg4 polypeptides and polynucleotides in the design of protocols for the treatment of (i) dysfunctions or diseases, including, but not limited to, epilepsy, migraine, cell proliferation, comportmental troubles, among others and diagnostic assays for such conditions.</p>		

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 99/07671

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/12 C07K14/705 C07K16/28 G01N33/566

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WARMKE JW ET AL: "A family of potassium channel genes related to eag in Drosophila and mammals" PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF USA, vol. 91, no. 8, 12 April 1994 (1994-04-12), pages 3438-3442, XP002092026 abstract; figure 1	1-3, 6-17,19
Y	EMEST20 DATABASE Accession number U69184 08-JAN-1998 (Rel. 54, Created) Zollo M., et al. Human DRES 61 mRNA sequence. XP002095400 the whole document	1-3, 6-17,19

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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Date of the actual completion of the international search

18 May 2000

Date of mailing of the international search report

31/05/2000

Name and mailing address of the ISA

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Authorized officer

Gurdjian, D

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 99/07671

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	TORAL J ET AL: "Use of cultured human neuroblastoma cells in rapid discovery of the voltage-gated potassium-channel blockers." J PHARM PHARMACOL, SEP 1994, 46 (9) P731-4, XP002095398 ENGLAND the whole document	17,19
A	SHI W ET AL: "Cloning of a mammalian elk potassium channel gene and EAG mRNA distribution in rat sympathetic ganglia." J PHYSIOL (LOND), SEP 15 1998, 511 (PT 3) P675-82, XP002095399 ENGLAND abstract; figure 1	1-3, 6-13,16, 17,19
A	SHI W ET AL: "Identification of two nervous system-specific members of the erg potassium channel gene family." J NEUROSCI, DEC 15 1997, 17 (24) P9423-32, XP002095412 UNITED STATES the whole document	1-3, 6-13,16, 17,19
A	TITUS SA ET AL: "The Drosophila erg K+ channel polypeptide is encoded by the seizure locus" JOURNAL OF NEUROSCIENCE, vol. 17, no. 3, 1 February 1997 (1997-02-01), pages 875-881, XP002092027 abstract; figure 1	1-3, 6-13,16, 17,19
P,X	WO 99 37677 A (MOCHIZUKI SHINOBU ;MIYAKE AKIRA (JP); YOKOI HIROMICHI (JP); YAMANO) 29 July 1999 (1999-07-29) abstract; figures SEQ.ID.1,2	1-11
P,X	WO 99 43696 A (AXYS PHARM INC) 2 September 1999 (1999-09-02) abstract; figure SEQ.ID.20	1-3,6-16
P,X	MIYAKE AKIRA ET AL: "New ether-a-go-go K+ channel family members localized in human telencephalon." JOURNAL OF BIOLOGICAL CHEMISTRY AUG. 27, 1999, vol. 274, no. 35, 27 August 1999 (1999-08-27), pages 25018-25025, XP000907262 ISSN: 0021-9258 the whole document	1-11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 99/07671

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 18 20
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
Claim 18 relating to agonists and claim 20 relating to antagonists to the polypeptide of
Claim 10 could not be searched as its subject-matter was insufficiently disclosed.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/EP 99 07671

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 18 20

Claim 18 relating to agonists and claim 20 relating to antagonists to the polypeptide of claim 10 could not be searched as its subject-matter was insufficiently disclosed .

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 99/07671

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W0 9937677 A	29-07-1999	AU 1982799 A	09-08-1999
W0 9943696 A	02-09-1999	AU 2780999 A	15-09-1999